

## VALIDATION OF HYBRID LEARNING MODEL DEVELOPMENT USING EMBEDDED SYSTEM

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The objective of the current research was to measure the validation Hybrid Learning Model development using Embedded System. The research method employed was borg and gall. Model validity test was carried out by experts in learning model, vocational education, media, and linguistics. Research data were collected using a questionnaire. Meanwhile, the data analysis was conducted using model validity test through Akien V test. Based on the results of model validation, it obtained and proved that *hybrid learning* model using *embedded* system was valid since it produced valid products in the forms of model books, lecturer manuals, student manuals, application guides, and teaching modules.

**Keywords:** *hybrid learning, embedded system, online learning*

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### Introduction

The current development of science and technology, particularly in the information and communication technology aspect increases very rapidly. It is natural for the experts to consider this matter as a revolution. In this digital era, we often hear and see the presence of technological innovations packaged in the form of Industrial Revolution 4.0. This was also stated by (Schwab, 2016), in his book entitled "*The Fourth Industrial Revolution*" that people lifestyle changes and work processes are fundamentally related to one another. Therefore, technology appears from various fields such as supercomputers, smart robots, driverless vehicles, genetic editing, and neurotechnology development so that humans can optimize brain function. Changes in all human life aspects through technological developments are also claimed by (World Economic Forum, 2016) and (Klosters & World Economic Forum, 2018) in Swiss regarding "Industry 4.0", that there will be 4 issues of human work in the future, including (1) artificial intelligence and robots which can reduce human workload; (2) fighting over the best human resources; (3) become a freelancer; and (4) the education system changes to a holistic/project-based curriculum.

The government immediately prepares various sectors in order to anticipate the presence of the digital era, particularly for the improvement of Human Resources (HR) in order to improve the education system in Indonesia (Hartono, 2018). This means that students can change their mindset in developing their abilities by utilizing technology to face the industrial revolution 4.0. The educational process is required to prepare students to be more communicative, collaborative, intelligent, creative, innovative, and independent. The learning process in higher education must be adjusted because it will have a very large impact on higher education. It is expected that higher education can make changes in every field that can adapt quickly, especially in the field of higher education.

In order to face these matters, the government has begun to improve the education system, particularly the vocational education or skills-based education. The industrial revolution 4.0 era will prepare human resources according to the industrial needs. It is essential for the vocational education to utilize digital technology in learning process since it can be carried out continuously without any limited space and time. Learning is not only done using a face-to-face system directly, but students can learn anywhere and anytime, even with anyone. Students also do not have to meet face-to-face with the educators but they can meet through virtual learning media through synchronous communication tools (*chat, video conference, audio conference, desktop sharing, whiteboard, and others*).

Changes in learning process from traditional learning to future learning approach has been recognized as 21st century learning in the industrial revolution 4.0 era. It can be performed anywhere, anytime, and with anyone just like when they study in the classroom, library, at home, or on the road with no time limit (morning, afternoon, or evening). Such learning can also be integrated with anyone including teachers, experts, friends, children, family, or community. Various learning resources can also be employed in this learning approach, such as textbooks, e-books, magazines, newspapers, internet, CD ROMs, radio, television, audio, video, journals, and so on. In this era, learning model helps to improve the students' competence. Therefore, Problem-Based Learning method is needed in the teaching and learning process where educators act as facilitators, mentors, and counselling for the students with active, collaborative, creative, and independent learning processes which are needed to face challenges in work and career in business and industry. Furthermore, according to (Trilling & Fadel, 2009), skills that are necessary for the 21<sup>st</sup> century are *life and career skills, learning and innovation skills*, as well as *information media and technology skills*, which means that Indonesian government and its people still have a lot of homework that must be achieved for the industrial revolution 4.0.

The existence of planning of 21st century learning process and industrial revolution 4.0 to virtual world technology will affect the education system, especially with a shift in face-to-face learning patterns towards education using information and communication technology as a supporting media for the teaching and learning process. Therefore, designing a learning process system to face the 21st century in the era of the industrial revolution 4.0 is needed. In essence, learning process is an effort to develop supporting media as learning resources so that the learning process occurs in the learners' self. Success in the learning process is measured as an interaction process between the educator and the learner. Lecturers are not a learning resource but only part of a learning resource designed to encourage the learning process to be more effective, efficient, and interesting. Therefore, the function of a lecturer will turn into a facilitator and a learning manager.

During the observation made by the researchers at Universitas Pembangunan Panca Budi Medan, it turned out that the learning process was still carried out conventionally in the classroom even though there were e-learning facilities, even though it was still content-based. Conventional method is a method that provide description and explanation to students in different times and place (Students, 2015). Conventional method is carried out with one-way communication to provide understanding to students in classroom.

Lecturers provide very limited learning materials along with limited face-to-face time in class so that it will result in limited knowledge provided to students as well. Such conventional method is carried out directly to students, so that differences in the abilities, knowledge, interests, talents, and learning styles among the students cannot be seen. Learning process is currently expected to be supported by using the e-learning concept which can be done face-to-face online with students just as it is done face-to-face offline. By adding embedding technology and various evaluation features that are carried out using intelligence

methods in the development of e-learning into hybrid learning, the resulting product is expected to be an innovative learning product using technology and communication. The development of this technology is expected to be more innovative by combining information and communication technology with integrated lesson materials (Naidu, 2006).

E-learning process can be utilized by the students to learn independently without forgetting the role of a lecturer who can motivate and assist students during the learning process. In addition to learning using e-learning, there is also face-to-face learning which is important and should not be ignored. Judging from the description that has been described above, it is very necessary to make efforts to overcome the shortcomings of conventional methods or e-learning by finding an alternative to cover these weaknesses. As an alternative solution to this weakness, a learning process with an integrated and systematic hybrid learning model can be employed. This is expected to make the learning process more effective, efficient, and practical.

Hybrid learning system can be developed using distance learning system that has been developed rapidly in various countries in the world as a modern education system. Distance education system becomes one of the alternatives to expand the scope of education in remote areas. The implementation of distance education system already has rules contained in the Law of the Republic of Indonesia number 12 of 2012, article 31 concerning Distance Education (PJJ) in Higher Education, namely a teaching and learning process that can be carried out remotely using various technology and communication media. Another regulation issued was the Regulation of the Minister of Education and Culture of the Republic of Indonesia Number 24 of 2012 concerning the Implementation of Distance Education (PJJ) in Higher Education, in which PJJ system is a part of the integration of learning system in the world of Indonesian education.

This system will be chosen as learning media by the community to gain access to higher quality and affordable education. It is further followed by the Regulation of Minister of Education and Culture No. 109 of 2013 (Article 2) concerning PJJ which aims to provide higher education services to community groups with limited distance and time so that they cannot attend face-to-face education. In this case, access will be expanded anywhere and anytime to facilitate higher education services during the learning and teaching process. PJJ has the characteristics of having openness, independence, and completeness by utilizing information and communication technology (ICT), and/or using other technologies. Through this PJJ system, everyone will get access to quality and affordable education without having to leave family, home, work, and career opportunities. To distribute quality education as a whole, the PJJ system needs to standardize learning outcomes, teaching materials, learning processes, learning assistance, and learning evaluations to achieve quality education that can be achieved by various groups who have limited space and time (Pannen et al., 2016). PJJ also provides long life education services through an innovative distance education system (*long life learning*).

There are several advantages of using hybrid learning method including (1) there is longer time arrangement and can be carried out anywhere and anytime; (2) education cost effectiveness; (3) learning is in accordance with the target and becomes more focused; (3) variations of online learning; (4) can integrate independently, as well as direct face-to-face connections (live); (5) learning does not stop when the lecturer leaves the class; (6) the different learning characteristics among the learners can be met; (7) learning is carried out independently, in real time and conventionally which is complementary; (8) learning can improve the accessibility of learning materials; (9) the learning process will not only implement face-to-face during teaching and learning process but will also add longer time using technology and communication; (10) the learning will facilitate and speed up the

communication process directly or indirectly between teaching staff and students; (11) the teaching and learning process can take place online or offline in/out of face-to-face lesson hours; (12) the learning makes it easier to manage and control the teaching and learning process at each lesson hour between educators and students; (13) hybrid learning is the most effective form of learning. Meanwhile, the shortcomings of Hybrid Learning are (1) various kinds of learning media so that it will be difficult to implement if the facilities and infrastructure are inadequate; (2) uneven distribution of facilities owned by schools, campuses, and students, such as computers and easy internet access; (3) lack of knowledge and use of technology by the campus community; (4) lack of skills of educators and teachers to use e-learning or hybrid learning; (5) it is necessary to spend a lot of time in developing and managing the hybrid learning system; (6) educators need to prepare many digital references as a reference for integrated learners; and (7) educators use maximum learning strategies to increase the potential use of hybrid learning systems.

Such learning system which is applied in accordance with the development of science and technology is known as *Hybrid Learning* (HL) system. This learning is a combination of various learning methods such as (1) conventional or face-to-face learning; (2) direct learning (*synchronous virtual collaboration*); (3) indirect learning (*asynchronous virtual collaboration*) and; (4) self-paced asynchronous learning. The learning system is carried out actively which is centered on students to improve their abilities and skills. This learning concept will be revitalized by the government to face the 21st century learning system in the industrial revolution 4.0 era. Direct learning (*synchronous virtual collaboration*) uses a distance learning system that employs various media of teaching materials electronically to facilitate communication between educators and students. Additional media used for distance learning will be integrated into the *e-learning* system of UNPAB Medan which was built by utilizing *embedded* system applications. This application can be carried out through face-to-face teaching activities carried out online or live online with the assistance of internet connection.

The implementation of this system can be carried out through several cycles and meetings with students in which they will learn different or new things so that they can further analyze what they have been learned. This will improve the way students think because it will encourage them to be able to learn independently which is carried out online. Therefore, students will have the thinking ability which can be optimized in facing the industrial revolution 4.0 era in the future (Ghiffar, Nurisma, Kurniasih, & Bhakti, 2018).

The purpose of this article was to develop a model and validate the development of the Hybrid Learning Model using a valid Embedded System.

## Method

This research applied borg and gal development model (Gall, 2006). At the model development stage, the development of Hybrid Learning Model was validated using the Embedded System to determine whether the model was valid or not. Current research involved experts in the field of learning models, vocational education, media, and linguistics. An instrument employed to measure the validity of the model was a questionnaire. The data obtained were further analyzed using model validation testing with the Akien V test.

## Results and Discussions

The model developed was Hybrid learning model, which is a learning model adapted from *Hybrid Learning* (HL) and *Problem Based Learning Model* (PBL). The integration of these two models will result in the synchronization of these two models resulting in the hybrid learning model syntax as follows: (1) Destination orientation

based on hybrid learning; (2) Organizing students for learning; (3) Assessing learning materials through the Internet; (4) Analyzing data from the study results; (5) Presenting the analysis results; (6) Evaluation Results (Evaluation Results); (7) Providing feedback.

Furthermore, expert validation is a process of providing validation to the hybrid learning model developed in introductory information technology courses. In this research, the content was validated in the form of a questionnaire that has been provided for the resulting product. There were five experts involved, including: 1) Dr. Ridwan, M.Sc., Ed; 2) Prof. Dr. Yasnur Asri, M.Pd; 3) Dr. Hansi Effendi, M. Kom; 4) Dr. Wahyudi, M.Sc; and 5) Yoseprizal, S.Kom.M.Kom.

### 1. Validaty of Learning Book Model

The validity of the *hybrid learning* model was conducted by using embedded systems in introductory information technology courses which were carried out through the validators' assessment. The product of the *hybrid learning* model book using embedded systems can be seen in Figure 1.

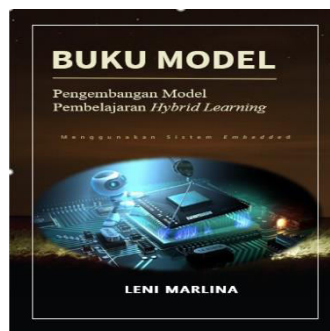


Figure 1. Hybrid learning model book

The following table presents the validity test score of model book.

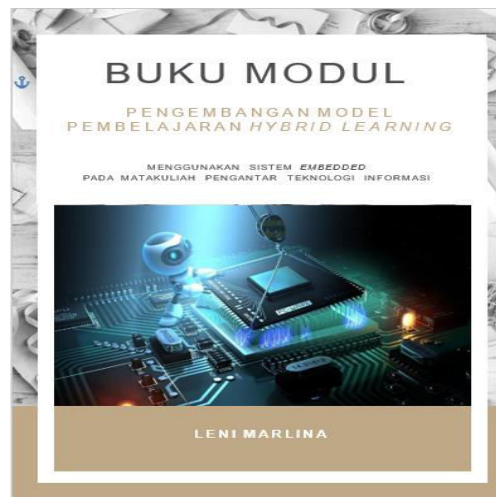
Table 1 Validity of Model Book

No.	Assessment Indicator	V Aiken Score	Category
1	Organization	0.85	Valid
2	Writing Format	0.84	Valid
3	Content Aspect	0.87	Valid
4	Language used	0.88	Valid
	Mean	0.86	<b>Valid</b>

The validity test results of the model book assessment indicators of organizational aspect obtained a mean score of 0.85 with a valid category, 2) writing format indicator obtained a mean score of 0.84 with a valid category, 3) content aspect indicator obtained a mean score of 0.87 with valid category, and 4) The language use indicator obtained a mean score of 0.88 with a valid category. In general, the overall assessment indicator for the model book is 0.86 with a valid category.

### 2. Validity of Teaching Module

The validity test of the introduction to information technology teaching module was carried out through the validator assessment. The product of the introduction to information technology teaching module book can be seen in Figure 2.



**Figure 2 Teaching Module**

The validity test results of teaching module as presented in the following Table

2.

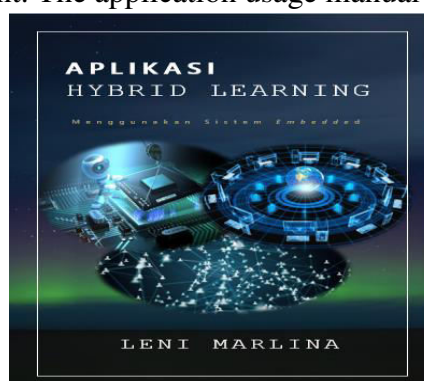
**Table 2 Validity of teaching Module**

No.	Assessment Indicators	V Aiken Score	Categories
1	Organization	0.90	Valid
2	Content and Writing Aspect	0.85	Valid
3	Language Use	0.81	Valid
	Mean	0.85	<b>Valid</b>

The validity results of the teaching module assessment indicators of organizational aspect obtained mean score 0.90 with a valid category; 2) The content and writing aspect obtained a mean score of 0.85 with a valid category; and 3) the language use obtained a mean score of 0.81 with a valid category. In general, the overall assessment indicator for the model book was 0.85 with a valid category.

### 3. Validity of Application User Manual

The validity of the application user manual was carried out through the validator assessment. The application usage manual product can be seen in Figure 3.



### Figure 3 Application User Manual

The following is the validity results of application user manual.

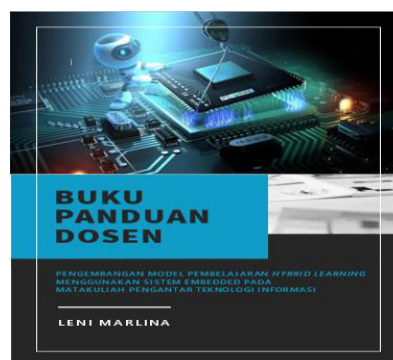
**Table 4 Validity of Model Book**

No.	Assessment Indicator	V Aiken Score	Category
1	Organization	0.87	Valid
2	Content feasibility	0.82	Valid
3	Language use	0.85	Valid
	Mean	0.85	<b>Valid</b>

The validity results of application user manual for the assessment indicators of organizational aspect obtained a mean score of 0.80 with a valid category, 2) Content feasibility obtained a mean score of 0.82 with a valid category, and 3) language use obtained a mean score of 0.85 with a valid category. In general, the overall assessment indicator for the application user manual was 0.85 with a valid category.

#### 4. Validity of Lecture Manual

The validity of the lecture manual for *hybrid learning* models using embedded systems can be seen in Figure 5



**Figure 5 Lecture manual for *hybrid learning***

Validity of lecture manual for *hybrid learning* model used embedded system can be seen in the following Figure 5

**Table 5 Validity of Lecture Manual**

No.	Assessment Indicator	V Aiken Score	Category
1	Instruction	0.85	Valid
2	Semester Lesson Plan Components	0.89	Valid
3	Language Use	0.85	Valid
	Mean	0.86	<b>Valid</b>

The validity results of the lecturer manual for the assessment indicators of instructional aspect obtained mean score of 0.85 with a valid category; 2) RPS component (Semester Learning Plan) obtained mean score of 0.89 with a valid category; and 3) the language use obtained mean score of 0.85 with valid category. In general, the overall indicator for the assessment of the lecturer's manual was 0.86 with a valid category.

#### 5. Validity of Students Manual

Validity of the hybrid learning model student manual using embedded systems can be seen in Figure 6



**Figure 6 Hybrid Learning Students Manual Book**

The validity results of the student manual book can be seen in Table 6 below.

**Table 6 Validity of Students Manual Book**

No.	Assessment Indicator	V Aiken Score	Category
1	Learning Design	0.86	Valid
2	Learning Method	0.83	Valid
3	Language Use	0.81	Valid
	Mean	0.83	<b>Valid</b>

The validity results of the student manual book assessment indicators of the Learning Design aspects obtained a mean score of 0.86 with a valid category, 2) Learning Methods obtained a mean score of 0.83 with a valid category, and 3) the language use obtained a mean score of 0.81 with valid category. In general, the overall student manual book assessment indicator was 0.83 with a valid category.



### 6). Validity of the Model Syntax

The analysis of model syntax analysis was carried out through several tests, including KMO test which obtained  $0.508 > 0.50$ , thus the variable is eligible for further analysis. Further analysis was carried out using *Bartlett of Sphericity* test obtaining  $0.071 < 0.050$ , therefore factor analysis can be continued.

Last, the results of the Component Matrix showed valid syntax steps and form a model. The results of the phases formation can be seen in the *Cree Plot*:

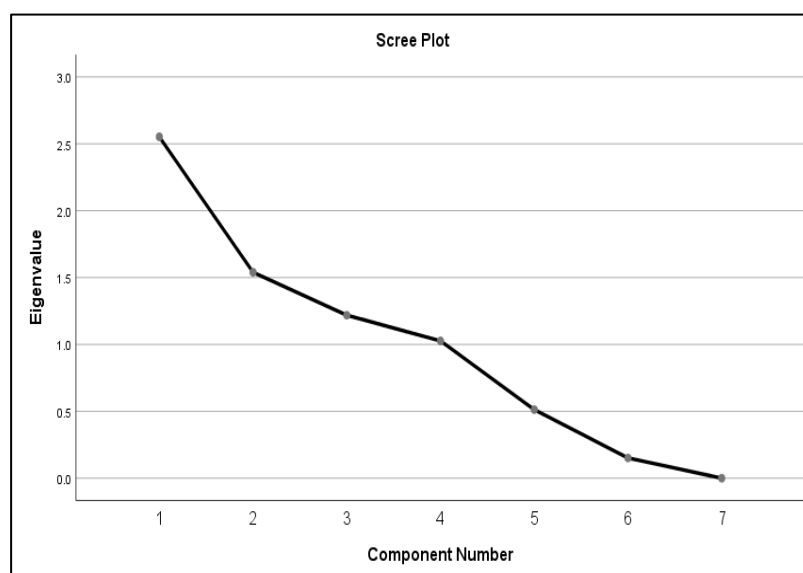


Figure 7 Plot of Phases Formation into Model

The screen plot results obtained 7 components tested. There were only 4 component points that have an Eigen value  $> 1$ , so that the 7 existing components have formed 3 factors, which are concluded from the formation of a complete model syntax, thus the model is valid.

### Conclusions

Based on the research results explained above, it is concluded that the developed model is a valid hybrid learning development model, which produces hybrid learning model books, teaching modules, lecturer manual and student manual, as well as application manual. The developed model is also quite practical, so it can be used in learning process. There are several limitations in the developed model including the internet access networks and requirement of a clear socialization of learning models to be applied.

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